MICROVOX TEXT TO SPEECH SYNTHESIZER

USERS MANUAL

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TABLE OF CONTENTS

	Page
Introduction	1-2
MicroVox Hardware	3-4
Speech Synthesizer and Inflection Circuitry	5-6
Device Control Codes	7-15
Setting the Serial Port	15-16
Parallel Input Port	17
Phoneme Codes	18-19
J3 - Connector Pinout	20
J1 - Connector Pinout	21
Phonetic Word List	22-25
Parts List	26-27
Layout	28
Schematics	29-32
Warranty	33

THE MICROVOX TEXT TO SPEECH SYNTHESIZER

The MicroVox is a stand alone intelligent peripheral that converts ASCII text to spoken English. The MicroVox is attached to the computer (or terminal, modem, etc.) via either a serial or parallel cable. Its operation is similar to that of a printer except that the output is speech rather than printed word. The MicroVox has many programmable options which produce its high level of intelligibility. It has the following features:

* Phoneme based speech synthesizer
* 6502 Microprocessor
* 64 crystal controlled inflection levels
* 700 character buffer (optional 2.7K)
* 6K byte text-to-phoneme algorithm
* Full ASCII character set recognition and echo
* Adjustable baud rates (75-9600)
* EIA RS232C and parallel input interfaces
* Phoneme access modes
* Serial X-on/X-off handshaking
* One watt amplifier and volume control
* Onboard power supply
* Music and sound effects capability

Basically, the MicroVox Speech Synthesizer consists of a 6502 based microcomputer with a voice synthesizer output port. It has a 6502 microprocesor, crystal controlled 75-9600 bps full handshaking serial interface, parallel input port, 2K bytes of RAM, 8K bytes of EPROM, and has an onboard power supply. The EPROM contains the operating system and text to speech algorithm.

Special control signals are sent from the host computer to select among many different user options. In general, these control signals are in the form: !(letter)(option). The exclamation point is a signal to the MicroVox that a control code follows. Options can be changed at any time by sending the appropriate codes preceding or imbedded within the text.

What is a Text to Speech Synthesizer ?

With the majority of speech synthesizer interfaces, text to speech, or the actual conversion from ASCII characters to phonemes, LPC formants, word codes etc., is left to the user. Such a conversion routine will be more or less elaborate, depending upon the required vocabulary. For short vocabularies, the conversion program might consist merely of a table of words and their appropriate synthesizer codes. When the required vocabulary becomes very long, or in fact unlimited, tables become cumbersome and a text to speech algorithm is required instead.

A text to speech algorithm is a program which takes ASCII data and performs a synthesis by rule analysis of character strings. It determines which characters are voiced and which are silent by following a set of general rules for pronouncing English (text to speech algorithms can be written for other languages as well). Text to speech algorithms vary in length depending upon exactness of voice translation. Typical algorithms are in the 4K to 8K byte range but, some of the more sophisticated programs are up to 80K bytes. The primary difference between a 6K and a 20K algorithm is more often the spelling of input text rather than any specific sound quality differences (an 80K algorithm can often be half look up tables for exceptions to the rules). For exact pronunciation it might be necessary to spell words differently to more easily fit the prescribed rules on the smaller algorithm, such as entering "com pu ter" instead of computer. The only other limitations are features such as pronunciation of punctuation or inflected speech. Both of these capabilities are supported in the MicroVox.

The MicroVox text to speech synthesizer is a smart peripheral. It speaks only those ASCII strings which are directed to it through either its serial or parallel input ports. The ASCII text can result from PRINT statements in BASIC or the contents of complete disk files. MicroVox connects to the computer in the same manner as a printer or modem and virtually anything that can be printed or viewed on the CRT can be vocalized.

The MicroVox is a combination of two major elements: a 6502 based microcomputer and a Votrax SC-01 speech synthesizer chip. The SC-01 is a CMOS (complimentary metal oxide semiconductor) chip which consists of a digital code translator and an electronic model of the vocal tract. Internally, there is a phoneme controller which translates a 6 bit phoneme and 2 bit pitch code into a matrix of spectral parameters which adjusts the vocal tract model to synthesize speech.

The output pitch of the phonemes is controlled by the frequency of the clock signal. The clock frequency is nominally 720 KHz but subtle variations of pitch can be induced to add inflection. This prevents the synthesized voice from sounding too monotonous or "robotlike".

Listed in Table 1 are the 64 phonemes defined for the English language (three produce no sounds). The phoneme sound is generated when a 6 bit phoneme code is transmitted to the SC-01. Each phoneme is internally timed and has a duration of 47-250 msec depending on the particular phoneme selected and the clock frequency. The computer operating system sends these codes to the synthesizer chip through a latched parallel output port and monitors the synthesizer's activities (the A/R line) through an interrupt line.

The MicroVox Hardware

As previously mentioned, the MicroVox is a stand-alone microcomputer configured to function as an intelligent peripheral. Figure 1 is a basic block diagram of MicroVox. It can be viewed as a general purpose 6502 based computer with a speech synthesizer attached as a memory mapped I/O port.

MicroVox is best explained by dividing the circuitry into four functional subsections: processor and timing, memory, serial and parallel I/O, and speech synthesizer. Figure 2 is the complete MicroVox schematic.

Processor and Data Rate Clock

The processor is a 1 MHz 6502. The processor and data rate clocks are derived by dividing down a 4.9152 MHz crystal through IC6. Using a 4.9152 MHz crystal (base is 75 times 2 to the 16th) and a 12 stage CD4040 binary divider (IC6), 9 rates are derived directly: 75 bps, 150 bps, 300 bps, 600 bps, 1200 bps, 2400 bps, 4800 bps, 9600 bps, and 19200 bps (while the hardware can produce 19200 bps, it is not supported by the operating system). The MicroVox will not communicate at 110 bps. See "Setting the serial port". The 6502 processor operates at a clock frequency of 611 KHz.

Memory Section

ICs 2-5 and 9 form the address decoding and memory section of the MicroVox. IC 9 decodes the 5 most significant address bits to create 8 strobes. They are defined as follows:

Name	Hex Address	Connection and Function
SEL0	000	IC2 Memory Block (RAM)
SEL1	800	IC3 Memory Block (RAM)
SEL2	1000	IC10 Serial Port
SEL3	1800	IC11 Parallel Ports
SEL4	8000	IC14 Inflection Clock Rate
SEL5	A000	IC14 Phoneme Latch
SEL6	C000	IC5 Memory Block (EPROM)
SEL7	E000	IC4 Memory Block (EPROM)

In the MicroVox configuration, ICs 2 and 3 are intended to be RAM while ICs 4 and 5 are EPROM or ROM. The pin designations for ICs 2 and 3 are for 2K by 8 RAM chips such as the Hitachi 6116 or Toshiba 2016 (these devices are 2716 pin compatible. You could also use 2716 EPROMs in these sockets). This programmable memory is used for conversion tables, register stacks, and the ASCII input buffer (the MicroVox can receive data faster than it can speak it). The basic MicroVox uses only one RAM chip which allows a 700 character input buffer. By adding the second RAM chip in IC3 (and changing a few EPROM constants), this buffer can be optionally expanded to 2.7K characters.

The text to speech algorithm is placed in EPROM/ROM positions ICs 4 and 5. Either 2716 (2K X 8), 2732 (4K X 8), or 2764 (8K X 8) devices can be used in these positions depending upon the jumper selections JP4 and JP5. The 8K byte MicroVox software will be either on two 2732 EPROMs and require both sockets or a single 8K 2764 (or ROM equivalent).

Serial and Parallel I/O

MicroVox, unlike most other voice synthesizers, has both serial and parallel input ports to receive ASCII characters. The serial port uses a 6850 asynchronous communications interface adapter (ACIA, IC10) which is software programmable. During initialization, the ACIAs functional configuration is preset. Considerations such as word length, clock division ratios, parity, stop bits, etc., are selected by properly setting bits in the ACIA's control register. The data rate is set by the system data rate clock (from SW2 and IC6) and data is sent and received from the Transmit and Receive data registers respectively. Information such as framing errors, parity errors, and buffer and handshaking status, are determined by reading the ACIA status register.

On the MicroVox, the serial port can be used with or without hardware handshaking (CTS, DCD, RTS, etc.). This is especially useful when communicating over modems or terminals which have no handshaking signals. Instead, the MicroVox software incorporates software handshaking.

When receiving ASCII text in the software handshaking mode the MicroVox sends an "@" to the host computer when its input buffer is almost full (the host should stop sending data). It sends a "#" when it is ready to receive data again. Obviously, even this can be ignored if the data rate from the host computer never exceeds the speed at which the buffer is emptied.

The parallel input section uses an 8255 PIA (IC11) which is also programmable. As configured, 8 bits of it are used to receive parallel format ASCII data such as would be transmitted to a parallel printer. Using 2 additional pairs for the strobe and acknowlege handshaking, the MicroVox can attach to any conventional Centronics printer interface. (As configured, the 34 pin edge connector is exactly compatible with the Radio Shack TRS line of computers and can connect directly to their 34 pin Centronics printer edge connector).

DIP switch SW1 also attaches to IC11. Switch positions 6 thru 8 set serial word length, stop bits, and parity on the ACIA; switch section 3 selects hardware or software handshaking; sections 1, 2, 4, and 5 are not used.

Speech Synthesizer and Inflection Circuitry

Probably the most important section of the MicroVox is the actual speech synthesizer circuitry. The MicroVox allows 64 levels of pitch inflection.

The output pitch of the phonemes is controlled by the frequency of the clock signal. The output pitch is a function of this clock input frequency and two pitch control lines, I1 and I2 (each acts independently). Four rather large variations in pitch (corresponding to !P1 thru !P4 in the operating system), can be achieved simply by using these manual inflection inputs. More subtle variations in output pitch are attained by externally controlling the synthesizer clock. Using the 1.22 MHz system clock and a digital rate multiplier, a programmable clock can be created to produce smaller and more defined pitch inflection changes.

On a SEL4 strobe, a four bit inflection code is latched into IC13 and applied to the rate multiplier. The four bit combination results in 16 clock rates from 614.4 KHz to 902.4 KHz in 19.2 KHz increments (corresponding to !R1 thru !R16 in the operating system). 20 KHz creates a relatively small pitch change by itself (out of a 720 KHz nominal input frequency) but, used dynamically in a sentence it creats a definite improvement in intelligibility.

The pitch levels !P1 thru !P4 are the base pitch and the 16 frequencies from the rate multiplier, !R1 thru !R16, are the clock rate. The combination of the two functions results in 64 pitch levels or inflections.

The pitch at which individual phonemes are pronounced may be controlled automatically by the text to speech algorithm, kept fixed, or altered by user command. Some users prefer automatic inflection, because of the variety it gives to the speech. Others think a computer should sound like a computer and prefer the flat speech to artificially intoned speech. Still others may wish to directly control the pitch to make the unit "sing" (pitch and rate codes may be mixed with phoneme codes to produce "singing") or pronounce words with special emphasis.

The user may control the base pitch setting independently of the clock rate. The user options are:

!P1 (low pitch)
!P2 (medium low pitch)
!P3 (medium high pitch)
!P4 (high pitch)

The user may also control the clock rate.

!R1 (slowest rate -- lowest level for the given base pitch)
!R2 (slightly faster)
!R3...!R16 (increasingly faster rates)

The MicroVox has the ability to play musical notes and produce sound effects. This is accomplished by using a program routine to toggle one bit of IC11 at a predetermined rate. This lead, in addition to the output from the speech synthesizer chip (IC12) is connected to the output amplifier. The results are similar to the sound produced on the internal speaker in an APPLE II computer (it uses the same technique).

OPERATOR INTERACTION WITH THE TEXT TO SPEECH SOFTWARE

The MicroVox is a stand alone intelligent peripheral that converts ASCII text to spoken English. The MicroVox is attached to the computer (or terminal, modem, etc.) via either a serial or parallel cable. Its operation is similar to that of a printer except that the output is speech rather than printed word. The MicroVox has many programmable options which produce its high level of intelligiblity. These options are called device control signals and are transmitted to the MicroVox along with the text.

Device controls signals are sent from the host computer to select among many different user options. In general, MicroVox control signals are in the form:

!(letter)(option)(option)

for example: !HXY

The exclamation point is a signal to the MicroVox that a control code follows. The user may if he wishes use any other character as the signal. This is done by giving the following instruction:

(old signal character)X(new signal character)

for example: !X$

will change the control signal from an exclamation point to a dollar sign and $X* will change it then from a dollar sign to an asterisk.

Device control signals can be imbedded anywhere in the text transmission and are not spoken. Once a device control signal has been sent to the MicroVox, all succeeding text entry will be subject to that default setting until it is changed. For example if letter by letter pronunciation is invoked with !E then all text will be spelled until a !T is sent to reinvoke text to speech translation.

Software Handshaking

If standard parallel or RS-232C serial connections are used the sending computer hardware will detect and examine the RTS signal and determine whether the MicroVox is ready to receive a character or, if busy, take appropriate action. However, many popular brands of microcomputers lack the hardware to detect RS-232C handshaking signals and these handshaking signals do not pass through modems back to mainframe computers. In the MicroVox, special software handshaking signals, described below, are provided for these purposes (in general, hardware handshaking is preferable whenever it is possible to use it, because it relieves the host computer's processor of the handshaking chores and allows use of higher data rates).

For software handshaking, switch position 3 on dip switch SW1 is set in the closed position (open is hardware handshaking). The following option is provided:

!H(busy character)(ready character)

Example: !H@#

In the example shown, the MicroVox will send the character "@" to the computer when it is unable to receive more data, and will send "#" to the computer when it is again ready to receive data. It is the responsibility of the computer programmer to write the software necessary for the use of these options.

NOTE: While in the example above the handshaking characters are '@' and '#', the default mode of the MicroVox uses the characters 'R' and 'B' instead. Use the above described method to set any other pair of handshaking characters.

Finally, it is possible to use the MicroVox with no handshaking by simply invoking the software handshaking mode and ignoring the handshaking transmissions. In this case, it is the user's responsibility to insert timing delays in the program so that data will not be sent to the MicroVox faster than it can handle the data.

Speech, Spelled Speech, Phoneme Code, and Music Modes

The MicroVox can operate in four different modes: text to speech, text to spelled speech, phoneme codes, and music. When the MicroVox is turned on it is in text to speech mode, however, the user can select among the following options:

!T (text to speech)
!E (spelled speech -- say each letter)
!C (phoneme codes)
!N (musical notes)

NOTE: The default mode is !T. To exit any mode you must enter another. For example, if you are in the !E mode, to return to text to speech you must type !T. Also, changing between mode frequently resets selected options to the default mode.

Text to Speech

The software used in the text to speech algorithm incorporated in the MicroVox is derived from an algorithm conceived by the Naval Research Laboratory. This algorithm combines word, morph and letter rules in a single table of about 400 rules. This table contains subtables for each letter of the alphabet and achieves very intelligible speech.

In the text to speech mode (!T), this algorithm attempts the correct pronunciation of any phrase sent to it. However, no program of reasonable size can possibly contain all the rules and exceptions for the pronunciation of English. Moreover, since the MicroVox lacks extra-sensory perception, it cannot tell for instance, when the user sends "READ" if the present or the past tense is meant. The solution when a word is not pronounced to the user's satisfaction is to alter the spelling. By typing RED or REED instead of READ, the user can be sure to get the desired pronunciation. If HICCOUGH is pronounced strangely, try HICCUP. Often it helps to break a word into syllables. Compare the pronunciation of TYPEWRITER and TYPE WRITE ER. Foreign words will require considerable ingenuity, since the MicroVox works on the principles of English pronunciation. Compare PARLEZ VOUS and PARLAY VOO.

Spelled Speech

The spelled speech mode is useful for abbreviations and words that a user might have difficulty in understanding. When this option is selected, every letter is pronounced separately. (By selecting the !A punctuation mode, punctuation will also be pronounced).

Example: !T THE WORD AWFUL IS SPELLED !E AWFUL !T

In this example, the MicroVox will say "THE WORD AWFUL IS SPELLED", and then spell out A W F U L. The !T at the end returns the Microvox to the text to speech mode.

Phoneme Mode

The MicroVox may also be programmed directly in phoneme codes. A space must be left between the mnemonic codes.
For example:

```
!C AE N D PA0 THV UH2 PA0 S E PA0 I Z PA0 B 01 AY I3 L I
NG PA0 H AH T PA1
```

will say "and the sea is boiling hot".

The intonation I or F modes can be either on or off when phoneme codes are used. If the intonation is off, the rate which is output will be the base rate. If it is on, intonation will be like that for text. If there are errors in the codes, the erroneous codes will be spoken as if they were text.

Music Mode

Music mode can be turned on by !N. In music mode, the following notation is used. There are 7 octaves centered about middle C, indicated by numbers from 1 to 7. Notes are A, B, C, D, E, F, G. A sharp is indicated by "+", flat by "-". The length of a note may be from 1 to 256 times an internal time constant. Rests are indicated by R. For instance 3F+26 means third octave, F sharp, 26 time constants long. R16 means a sixteen time constant rest.

The music mode suspends the MicroVox operating system and no serial or parallel data can be received during music output. Also, entering music mode will reset most previously set control codes.

Text Synchronization

For many applications it is important to synchronize speech with external such as text or actions appearing on the screen. For instance, an instructional program may require placing a picture on the screen when certain speech output begins and a question on the screen when it ends. For synchronization, the following option is provided:

!K(synchronization character)

Example: !K#JOHN!K%MARSHA!K$

In the example shown, the MicroVox will send a "#" back to the computer just before starting to say "JOHN"; it will send a "%" to the computer just after saying "JOHN" and just before starting to say "MARSHA"; and it will send a "$" character to the screen just after saying "MARSHA".

Example: LOOK AT THE SCREEN NOW !K#

In this example, a "#" will be transmitted to the host computer after saying "LOOK AT THE SCREEN NOW".

None of these special synchronization characters will be spoken. It is the programmer's responsibility to use the incoming synchronization characters to coordinate the screen display with the speech.

Phrase Termination

Many aspects of English pronunciation are controlled by the context in which a given letter or word is spoken. For this reason, the MicroVox will await a complete phrase before translating from text to speech. If the user does not specify otherwise, the MicroVox will wait to translate a phrase until it has received one of the following phrase terminating characters:

(1) a period followed by two spaces or a carriage return
(2) a comma, semicolon, colon, exclamation point, or question mark followed by a space or carriage return.
(3) a carriage return

For some types of output, such as computer programs or poems, the user will want each line read as a separate phrase. For others, such as ordinary English text, the user may not want a carriage return to terminate a phrase. The user is given the following options to deal with this situation:

!L and !W

"!W" means "Whole text pronunciation". If this option is selected, a carriage return will not terminate a phrase unless the carriage return is preceded by one of the punctuation marks indicated in (1) and (2) above.

"!L" means "Line-by-line pronunciation". If this option is selected, a carriage return will always be treated by the MicroVox as terminating a phrase. When the MicroVox is first turned on it is in the "L" mode.

Rather than send a special signal to terminate a phrase, the user may wish to have the MicroVox treat a phrase as terminated if a certain delay occurs without any phrase terminator being received. Possible applications of this option include situations where the user does not fully control the output. For instance, suppose the MicroVox is passively connected to a transmitting device which doesn't send any of the terminating characters listed above (maybe it sends "STOP" instead). In such a case, there is no way to insert phrase termination characters in the output stream. However, if the MicroVox is set to treat a half second delay without receipt of information as the end of a phrase, computer output will not be lost or ignored.

The user is given the following option to provide delayed phrase termination:

!D(delay number)

!D1 through !D8 result in a delay of 50 x 2n milliseconds where "n" is the number following "D" (Note: If too short a delay is used, a phrase may be translated in pieces resulting in odd intonation or pronunciation, since the MicroVox uses the context of letters and words to determine their pronunciation.)

!D9 is a special case. The MicroVox waits for a phrase terminating character even if it has to wait forever. !D9 is the default mode (at power up) and should be used with slow data sources such as hand typing on a terminal.

This selectable delay feature is particularly useful for the handicapped. It allows a blind programmer to use a standard unintelligent terminal. This is facilitated by connecting the MicroVox to receive the output from both the user and the computer. Using the "!D" command, the MicroVox can echo all communication either way. If the delay is set to about 0.1 seconds, keys pressed by the user would be echoed as spelled letters because the slight delay between them will be treated as an end of phrase but, output generated by the computer will be spoken as complete lines, because there generally will be no significant delay between characters. The delay may be varied to fit the particular application.

The MicroVox must be in the !F mode before entering the D mode. Also, once in the D mode, other control changes can only be received if the MicroVox is set to !D9 first (so that it can interpret the input rather than just echo the characters).

Intonation

Within the MicroVox, a special intonation algorithm is included. However, providing realistic intonation is much more difficult than choosing the correct phonemes. Most intonation patterns are not represented in English spelling. Without knowing the writer's state of mind, achieving the proper intonation may require grammatical parsing of a sentence. The algorithm attempts to raise the pitch on stressed syllables, raising it at the start of sentences and before commas, lowering the pitch before the period at the end of a sentence. Before a question mark, the pitch is raised, unless the sentence begins with a question word (who, what, when, where, etc.), in which case it is lowered.

The pitch at which individual phonemes are pronounced may be controlled automatically by the text to speech algorithm, be kept fixed, or be altered by user command. Some people prefer automatic inflection, because of the variety it gives to the speech, even though the inflection is often not accurate. Others think a computer should sound like a computer and prefer the flat speech to artificially intoned speech. Still others may wish to experiment with controlling the pitch themselves to optimize intelligibility. This control can extend even to make the MicroVox "sing".

The hardware in the MicroVox allows control of pitch in two different ways. The VOTRAX SC-01A synthesizer chip has four selectable pitch levels. In addition, the output pitch may be varied by selecting one of sixteen different rates for the clock which controls the synthesizer chip. When the MicroVox is first turned on, the synthesizer chip is set to base pitch level 1 (low) and clock rate #5 (defined below). The intonation

is generated by an algorithm which selects an appropriate clock rate for each phoneme. To turn on or off the automatic intonation algorithm, the user may send the command:

!F (flat intonation -- monotone)

and the output rate will stay at the default base and clock rate. To invoke automatic clock rate setting, the user may send the command:

!I (inflected intonation by algorithm)

The intonation algorithm adds or subtracts from the base rate to ultimately select the final voice pitch. Using the !I mode however, only four clock rate pitch level shifts (out of 16 possible) are used.

The user may decide not to implement automatic inflection on all text to speech translation yet desire to add certain pitch changes on specific words or phonemes. This can be easily done on the MicroVox since the base pitch and the clock rate can be controlled independently and changed at any time. The user options are:

!P1 (low pitch)
!P2 (medium low pitch)
!P3 (medium high pitch)
!P4 (high pitch)

The user may also control the clock rate:

!R1 (slowest rate, lowest level for the given base pitch)
!R2 (slightly faster)
!R3...!R16 (increasingly faster rates)

Example: !P1 !R5 THIS IS A !R8 TEST

In this example, "THIS IS" will be spoken at clock rate R5 and "TEST" will be spoken at R8. (Note: The clock rate will remain at R8 from then on unless changed).

Example:!F !P1 !R5 IS YOUR NUM !R8 BER !R4 FOUR FIVE !R9 NINE ?

In this example, we can make a question sound more like a question by adding pitch changes at important points in the sentence. "IS YOUR" and "NUM" are spoken at R5. "BER" is raised in pitch to R8 and then, "FOUR FIVE" (you could also use 45) is pronounced at a lower frequency of R4. Finally, "NINE" is raised in pitch to R9 to end the sentence in a questioning tone. The question mark will only be spoken if the punctuation modes (!A or !M) are invoked.

Note: When using the manual inflection mode, it is important to set flat inflection (!F) mode or the algorithm will try to add automatic inflection in addition to that manually selected. Also, pitch and clock rates may be changed at any time in any mode.

Punctuation modes

There are three modes for pronunciation of punctuation in the MicroVox. The user options are:

!A (all mode --all punctuation pronounced)
!M (most mode -- all punctuation pronounced except return, linefeed, and space)
!S (some mode -- only unusual punctuation pronounced)

When the MicroVox is turned on it is in "some" mode. In the !M mode spaces between words are treated as pauses and can be used to regulate the pace of speech or emphasize particular words.

The MicroVox recognizes and pronounces all ASCII characters with codes between hex 20 and hex 7F. The operating system does not recognize control codes other than BACKSPACE (08), TAB (09), LINE FEED (0A), RETURN (0D), an ESCAPE (1B). Receipt of other control codes or nulls, can have unpredictable results since the MicroVox uses some of them for internal coding. Illegal control codes should be avoided in the text sent to the MicroVox.

On Line / Off Line Mode

The MicroVox can be selectively turned on and off line (it has to remain powered, however). This capability allows it to be attached in parallel with another peripheral such as a printer, yet not speak what is being printed. The control code is:

!O (On Line - MicroVox is operational. It responds to all device codes and text input)

!Q (Quit - Off Line - MicroVox only responds to !O)

Default Modes

When the MicroVox is powered up certain default modes are in force. They are equivalent to entering the following commands:

```
!O          on line
!P1 !R5     low base pitch, clock rate #5
!F          flat intonation
!T          text to speech mode
!S          some punctuation
!L          Line by line pronunciation
!D9         wait for carriage return phrase terminator
```

(When shipped from the factory, MicroVox is set for 300 bps, 8 bit words, no parity, 2 stop bits, and software handshaking)

At any time these defaults are to be changed, simply send the control code to the MicroVox. The codes can be transmitted separately or imbedded in text. For example, entering THIS IS A TEST, and a carriage return will result in that phrase being spoken with no intonation. To add automatic intonation the sentence becomes (all sentences are presumed to end with a carriage return):

```
!I THIS IS A TEST
```

From this point on all spoken text will have automatic inflection unless flat intonation is resumed with !F.

As previously mentioned, intonation can be added selectively or by the automatic algorithm. You can say the following sentence four ways:

1. text to speech, no added inflection

```
!T !F
PLEASE ENTER YOUR ACCESS NUMBER
```

2. automatic inflection in text to speech mode

```
!T !I
PLEASE ENTER YOUR ACCESS NUMBER
```

3. selected inflection in text to speech mode

```
!T !F !P1 !R5
PLEASE !R8 EN !R5 TER !R7 YOR !R5 ACCESS NUMBER
```

4. phoneme input mode with selected intonation

```
!F !C !P1!R5
P L E1 Y Z  PA1 PA1 PA1 PA1 !R9 EH1 EH3 N !R5 T ER PA1 Y
!R8 O2 O2 O2 !R5 R PA1 !R7 AE1 !R5 K S EH1 EH3 S PA1 N UH1
M B ER
```

These examples demonstrate various ways in which the user can increase intelligibility of the synthesized speech. The MicroVox is completely programmable, you can combine text to speech with either selective or automatic intonation or optimize pronunciation by choosing exactly the pitches and phonemes you wish. An exaggerated example of combined pitch and phoneme control can actually allow MicroVox to sing as demonstrated in a bar of "happy birthday" and a musical scale.

"Happy Birthday"

```
!C !P3 !R3
H H H AE1 AE1 AE1 AE1 AE1 AE1 P P !P2!R5 Y Y Y !P3!R5 B ER
ER ER ER R TH TH TH TH !R1 D A1 A1 A1 A1 I3
!R9 T IU IU IU IU U1 U1 U1 U1 U1 !R7 Y1 IU IU IU U1 U1 U1
U1 U1 U1

!C
!P1 !R1 D D E1 E1 Y Y Y
!P1 !R5 E1 E1 E1 Y Y Y
!P1 !R11 EH1 EH1 EH1 EH2 F F F
!P2 !R5 D J J E1 E1 Y Y Y
!P2 !R11 A1 A1 A1 A1 A1 Y
!P2 !R14 B B E1 E1 Y Y Y
!P3 !R11 S S E1 E1 Y Y Y
!P3 !R15 D D E1 E1 Y Y Y
```

Summary Table of Device Codes

```
!O, !Q - On line and Off line
!K   - synchronize speech and text
!L   - line by line pronunciation
!W   - whole text pronunciation
!E   - each letter pronunciation
!C   - pronounce by direct phoneme input
!N   - produce musical notes
!T   - pronounce by text-to-speech algorithm
!A, !M, or !S  - speak all, most, or some punctuation
!F   - set monotone or flat intonation
!I   - set automatic inflected intonation
!P and !R  - set intonation base pitch and clock rate
!D1-!D8 and !D9 - set phrase terminator delay
```

SETTING THE SERIAL PORT

DTE/DCE Setting

Behind J1 (the DB-25 serial connector) on the PC board is a 2 by 3 header and two jumpers. These jumpers set whether pins 2 and 3 are transmit data and receive data respectively or vice versa. As received from the factory, the jumpers are in the DCE position and pin 2 is RD and pin 3 is TD. To reverse these designations, place the jumpers in the DTE positions.

Data Rate

SW2 is the data rate (sometimes called BAUD rate) selection switch. The data rates are listed along side SW2.

SW2 can be either a 2 by 8 or 9 position Berg type pin connector or a 16 pin DIP switch. If a Berg connector is installed, a jumper is provided to select the desired data rate. Simply place it across the pair of terminals next to the desired data rate.

If SW2 is a DIP switch, close the switch position next to the desired data rate. Only that one position should be closed and the other seven positions should be in the open position. For 75 bits per second, it will be necessary to attach a physical jumper across JP1. All positions on SW2 should be left open.

Handshaking

For software handshaking, switch position 3 on dip switch SW1 is set in the closed position. For hardware handshaking, switch position 3 is left open.

If standard EIA RS-232C serial connections are used, the sending computer hardware will detect and examine the RTS signal and determine whether the MicroVox is ready to receive a character or, if busy, take appropriate action.

With software handshaking, the MicroVox will send the character "R" to the computer when it is unable to receive more data, and will send "B" to the computer when it is again ready to receive data. It is the responsibility of the computer programmer to write the software necessary for the use of these options.

Finally, it is possible to use the MicroVox with no handshaking by simply invoking the software handshaking mode and ignoring the handshaking transmissions. In this case, it is the user's responsibility to insert timing delays in the program so that data will not be sent to the MicroVox faster than it can handle the data.

Word Length, Parity and Stop Bits

Three switch positions on SW1 set the transmission protocol. The following is a list of the eight possibilities and their functions:

Function	Position 6	Position 7	Position 8
7 bits, EP, 2SB	closed	closed	closed
7 bits, OP, 2SB	closed	open	closed
7 bits, EP, 1SB	closed	closed	open
7 bits, OP, 1SB	closed	open	open
8 bits, 2SB	open	closed	closed
8 bits, 1SB	open	open	closed
8 bits, EP, 1SB	open	closed	open
8 bits, OP, 1SB	open	open	open

EP = Even Parity OP = Odd Parity SB = Stop Bit(s)

PARALLEL INPUT PORT

In addition to the serial input port, the MicroVox also has a parallel input connector. The MicroVox operating system is interrupt driven and can receive data from either or both input ports simultaneously (however, this can create a confusing situation unless the data is coordinated in some manner). In normal use, the MicroVox expects to interact with a host computer on only one input at a time and it is best not to have anything plugged into the unused connector.

The parallel input port of the MicroVox is 8 bits with strobe and acknowlege handshaking. It is configured as a 34 pin edge connector and is Centronics printer port signal compatible. A signal list and pinout is listed elsewhere in this manual.

Table 1 Phoneme codes

HEX PHONEME CODE	PHONEME SYMBOL	DURATION (msec)	EXAMPLE WORD
00	EH3	59	jacket
01	EH2	71	enlist
02	EH1	121	heavy
03	PA0	47	no sound
04	DT	47	butter
05	A2	71	made
06	A1	103	made
07	ZH	90	azure
08	AH2	71	honest
09	I3	55	inhibit
0A	I2	80	inhibit
0B	I1	121	inhibit
0C	M	103	mat
0D	N	80	sun
0E	B	71	bag
0F	V	71	van
10	CH	71	chip
11	SH	121	shop
12	Z	71	zoo
13	AW1	146	lawful
14	NG	121	thing
15	AH1	146	father
16	OO1	103	looking
17	OO	185	book
18	L	103	land
19	K	80	trick
1A	J	47	judge
1B	H	71	hello
1C	G	71	get
1D	F	103	fast
1E	D	55	paid
1F	S	90	pass

HEX PHONEME CODE	PHONEME SYMBOL	DURATION (msec)	EXAMPLE WORD
20	A	185	day
21	AY	65	day
22	Y1	80	yard
23	UH3	47	mission
24	AH	250	mop
25	P	103	past
26	O	185	cold
27	I	185	pin
28	U	185	move
29	Y	103	any
2A	T	71	tap
2B	R	90	red
2C	E	185	meet
2D	W	80	win
2E	AE	185	dad
2F	AE1	103	after
30	AW2	90	salty
31	UH2	71	about
32	UH1	103	uncle
33	UH	185	cup
34	O2	80	for
35	O1	121	aboard
36	IU	59	you
37	U1	90	you
38	THV	80	the
39	TH	71	thin
3A	ER	146	bird
3B	EH	185	get
3C	E1	121	be
3D	AW	250	call
3E	PA1	185	no sound
3F	STOP	47	no sound

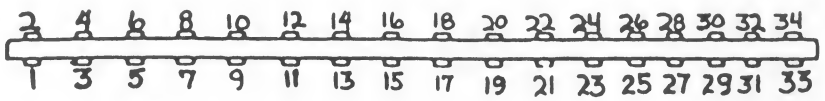
Note: T must precede CH to produce "CH" sound.
D must precede J to produce "J" sound.

J3 34 PIN PARALLEL INPUT CONNECTOR PINOUT

PIN	SIGNAL	DESCRIPTION
1	Strobe	Data Output Strobe
2	GND	
3	D0	Output bit 0
4	GND	
5	D1	Output bit 1
6	GND	
7	D2	Output bit 2
8	GND	
9	D3	Output bit 3
10	GND	
11	D4	Output bit 4
12	GND	
13	D5	Output bit 5
14	GND	
15	D6	Output bit 6
16	GND	
17	D7	Output bit 7
18	GND	
19	N/C	no Connection
20	GND	
21	ACK	Data Strobe Acknowlege
22	GND	
23	GND	
24	GND	
25	N/C	No Connection
26	N/C	No Connection
27	GND	
28	N/C	No Connection
29	N/C	No Connection
30	N/C	No Connection
31	GND	
32	N/C	No Connection
33	GND	
34	GND	

Note: All GND signals are common. All inputs are LSTTL.

VIEWED FACING THE CONNECTOR



J1 25 PIN DB-25 SERIAL CONNECTOR PINOUT

PIN	SIGNAL	DESCRIPTION
1	GND	
2	TD	Transmit Data
3	RD	Receive Data
4	RTS	Request to Send
5	CTS	Clear to Send
6	N/C	No Connection
7	GND	
8	CD	Carrier Detect
20	DTR	Data Terminal Ready

Note: All undesignated pins are open circuit.
Pins 2 and 3 can be interchanged between DTE/DCE designation. See section on serial port for explanation.

Table 2

TYPICAL PHONETIC WORD LIST

A	Al, AY, Y
able	Al, Y, B, UH3, L
about	UH1, B, UH2, AH2, Ul, T
actual	AE1, EH3, K, T, CH, Ul, UH3, L
add	AE1, EH3, D
adjust	UH1, D, J, UH1, UH3, S, T
B	B, E1, Y
back	B, AE1, AE1, K
basic	B, Al, Y, S, I2, K
been	B, EH1, EH3, N
before	B, Y, F, O2, O2, R
better	B, EH1, EH3, T, ER
C	S, E1, Y
came	K, Al, AY, Y, M
can	K, AE1, EH3, N
car	K, AH2, UH3, R
catalog	K, AE2, EH3, DT, UH3, L, AW2, AW2, G
change	T, CH, Al, AY, Y, N, D, J
D	D, E1, Y
data	D, A2, Y, DT, UH1
date	D, A2, AY, Y, T
decide	D, Y, S, AH2,EH3, Y, D
decision	D, Y, S, I2, ZH, UH3, N
deliver	D, Y, L, I2, V, ER
E	E1, Y
early	ER, R, L, Y
either	E1, Y, THV, ER
empty	EH2, EH3, M, P, T, Y
end	EH2, EH3, N, D
exact	EH2, EH3, G, PA0, Z, AE2, EH3, K, T
F	EH1, EH2, F
fact	F, AE2, EH3, K, T
fault	F, AW, L, T
final	F, AH2, Y, N, UH3, L
first	F, ER, R, S, T
follow	F, AH1, AW2, L, O1, Ul
G	D, J, E1, Y
game	G, A2, AY, Y, M
good	G, OO1, OO1, D
great	G, R, A2, Y, T
ground	G, R, AH1, UH3, W, N, D
grow	G, R, O1, Ul
H	Al, AY, Y, T, CH
hand	H, AE1, EH3, N, D
have	H, AE1, EH3, V
hear	H, AY, I3, R
heavy	H, EH1, V, Y

```
high        H, AH1, EH3, Y

I           AH1, EH3, I3, Y
important   I1, I3, M, P, O2, O2, R, T, EH3, N, T
include     I1, I3, N, K, L, IU, U1, U1, D
inform      I1, I3, N, F, O2, O2, R, M
insert      I1, N, S, R, R, T
instead     I1, I3, N, S, T, EH1, EH3, D

J           D, J, EH3, A1, AY, Y
job         D, J, AH1, UH3, B
join        D, J, O1, UH3, I3, AY, N
joy         D, J, O1, UH3, I3, AY
judge       D, J, UH1, UH2, D, J
jump        D, J, UH1, UH2, M, P

K           K, EH3, A1, AY, Y
keep        K, E1, Y, P
key         K, E1, Y
keyboard    K, AY, Y, B, O1,O2, R, D
kill        K, I1, I3, L
knowledge   N, AH1, UH3, L, I3, D, J

L           EH1, EH3, UH3, L
language    L, AE1, EH3, NG, G, W, I1, D, J
large       L, AH1, R, D, J
left        L, EH1, EH3, F, T
length      L, EH1, EH3, NG, TH
listen      L, I1, I3, S, I2, N

M           EH1, EH2, M
make        M, A1, AY, Y, K
many        M, EH2, EH2, N, Y
match       M, AE1, EH3, T, CH
memory      M, EH1, EH3, M, ER, Y
message     M, EH1, EH3, S, I2, D, J

N           EH1, EH2, N
name        N, A1, AY, Y, M
near        N, AY, I1, R
need        N, E1, Y, D
next        N, EH1, EH3, K, PA0, S, T
none        N, UH1, UH3, N

O           O2, O1, U1
object      UH1, B, D, J, EH1, EH3, K, T
obsolete    AH1, UH3, B, S, UH3, L, AY, Y, T
often       AW2, AW2, F, I3, N
omit        O1, U1, M, I1, I3, T
other       UH1, UH3, THV, ER

P           P, E1, Y
package     P, AE1, EH3, K, I1, D, J
paper       P, A1, Y, P, ER
part        P, AH1, R, T
person      P, ER, S, UH1, N
phone       F, O1, U1, N

Q           K, Y1, IU, U1, U1
qualify     K, W, AW1, L, I1, F, AH1, EH3, Y
```

```
quantity   K, W, AH1, N, T, I3, T, Y
question   K, W, EH1, EH3, S, T, CH, UH3, N
quick      K, W, I1, I3, K
quiet      K, W, AH1, EH3, AY, I2, T

R          AH1, UH2, ER
raise      R, A1, AY, Y, Z
reach      R, E1, Y, T, CH
ready      R, EH1, EH3, D, Y
remain     R, E1, M, A1, AY, Y, N
resistor   R, E1, Z, I1, S, T, ER

S          EH1, EH2, S
safe       S, A1, AY, Y, F
sale       S, A1, A2, AY, UH3, L
schedule   S, K, EH1, EH3, D, J, IU, U1, L
scrap      S, K, R, AE1, EH3, P
section    S, EH1, EH3, K, SH, UH3, N

T          T, E1, AY, Y
talk       T, AW, K
technical  T,  EH1, EH3, K, N, I3, K, UH3, L
terminal   T, ER, M, EH3, N, UH2, L
think      TH, I1, I3, NG, K
time       T, AH1, EH3, Y, M

U          Y1, IU, U1, U1
under      UH2, UH2, N, D, ER
uniform    Y1, IU, U1, N, I3, F, O1, R, M
until      UH2, UH2, N, T, I1, I3, L
up         UH1, UH2, P
urgent     R, R, D, J, I3, N, T
us         UH1, UH2, S
use        Y1, IU, U1, U1, Z

V          V, E1, AY, Y
vacant     V, A1, Y, K, EH3, N, T
valid      V, AE1, UH3, L, I1, D
value      V, AE1, EH3, L, Y1, IU, U1
vendor     V, EH1, EH3, N, D, ER
vent       V, EH1, EH3, N, T
verify     V, EH1, R, I3, F, AH1, EH3, Y
very       V, EH1, R, Y
via        V, E1, AY, UH2, UH3
victor     V, I1, I3, K, T, ER
voice      V, O1, UH3, I3, AY, S
void       V, O1, UH3, I3, AY, D
volt       V, O2, O2, L, T
volume     V, AH1, UH3, L, Y1, IU, U1, M

W          D, UH1, B, UH3, L, Y1, IU, U1
wage       W, A1, AY, Y, D, J
wait       W, A1, AY, Y, T
want       W, AH1, UH3, N, T
was        W, UH1, UH3, Z
wash       W, AW, SH
water      W, AH1, UH3, T, ER
watt       W, AH1, UH3, T
wave       W, A1, AY, Y, V
we         W, E1, Y
```

```
weapon     W, EH2, EH2, P, UH1, N
wednesday  W, EH1, N, Z, D, A1, I3, Y
week       W, E1, Y, K
weigh      W, A2, A2, Y
went       W, EH1, EH3, N, T
west       W, EH1, EH3, S, T
wet        W, EH1, EH3, T
what       W, UH3, UH1, T
wheel      W, E1, Y, L
when       W, EH1, EH3, N
where      W, EH3, A2, EH3, R
which      W, I1, I3, T, CH
while      W, AH1, EH3, I1, UH3, L
whiskey    W, I1, I3, S, K, AY, Y
white      W, UH3, AH2, Y, T
who        H, IU, U1, U1
will       W, I1, I3, L
window     W, I1, N, D, O1, U1
winter     W, I1, I3, N, T, ER
wire       W, AH1, EH3, AY, R
with       W, I1, I3, TH
withdraw   W, I1, I3, TH, D, R, AW
without    W, I1, I3, TH, UH2, AH2, U1, T
word       W, ER, R, D
work       W, ER, R, K
wrong      R, AW, NG

X          EH1, EH2, K, PA0, S
x-ray      EH1, EH2, K, PA0, S   R, A1, I3, Y

Y          W, AH1, EH3, I3, Y
yankee     Y1, AE1, EH3, NG, K, E1, Y
yard       Y1, AH1, R, D
year       Y1, AY, I3, R
yellow     Y1, EH1, EH3, L, O1, U1
yes        Y1, EH3, EH1, S
yesterday  Y1, EH3, EH1,S, T, ER, D, A1, I3, Y
yet        Y1, EH1, EH3, T
your       Y, O2, O2, R

Z          Z, E1, Y
zap        Z, AE1, EH3, P
zero       Z, AY, I1, R, O1, U1
zone       Z, O1, U1, N
zulu       Z, IU, U1, L, IU, U1
```

MICROVOX PARTS LIST

C1	0.01 Mfd 16V Ceramic Disc
C2	0.1 Mfd 16V Ceramic Disc
C3	0.1 Mfd 16V Ceramic Disc
C4	100 Mfd 25V Electrolytic
C5	0.1 Mfd 16V Ceramic Disc
C6	220 Mfd 25V Electrolytic
C7	0.1 Mfd 16V Ceramic Disc
C8	10 Mfd 25V Electrolytic
C9	n/a
C10	220 Mfd 25V Electrolytic
C11	0.1 Mfd 16V Ceramic Disc
C12	0.1 Mfd 16V Ceramic Disc
C13	0.1 Mfd 16V Ceramic Disc
C14	0.1 Mfd 16V Ceramic Disc
C15	0.1 Mfd 16V Ceramic Disc
C16	0.1 Mfd 16V Ceramic Disc
C17	0.1 Mfd 16V Ceramic Disc
C18	2200 Mfd 25V Electrolytic
C19	470 Mfd 25V Electrolytic
C20	10 Mfd 25V Electrolytic
C21	10 Mfd 25V Electrolytic
C22	10 Mfd 25V Electrolytic
D1	1N4148
D2	KBP02 Bridge or equivalent
ZD1	1N4742A
ZD2	1N4742A
IC1	6502 Microprocessor
IC2	2016 1K X 8 RAM
IC3	2016 1K X 8 RAM (optional)
IC4	2732 EPROM (programmed)
IC5	2732 EPROM (programmed)
IC6	CD4040
IC7	74LS04
IC8	74LS00
IC9	74LS139
IC10	6850 UART
IC11	INS8255 PIO
IC12	SC-01A Phoneme Synthesizer
IC13	74LS175
IC14	74LS74
IC15	LM386 AMP
IC16	7407
IC17	MC1488
IC18	MC1489
IC19	7497
LED1	TIL 220, RED
R1	2.2K (RED RED RED)
R2	4.7K (YEL VIO RED)
R3	4.7K
R4	4.7K
R5	2.2K

```
R6          2.2K
R7          2.2K
R8          470K      (YEL VIO YEL)
R9          3.3K      (ORG ORG RED)
R10         10K       (BRN BLK ORG)
R11         10K POT W/SWITCH
R12         10 OHM    (BRN BLK BLK)
R13         4.7K
R14         33K       (ORG ORG ORG)
R15         1.8K      (BRN GRY RED)
R16         1.8K
R17         33 OHM    (ORG ORG BLK)
R18         10 OHM    (BRN BLK BLK)
R19         33 OHM 1/2 W
R20         100 OHM 1/2 W (BRN BLK BRN)
R21         470 OHM (GRN VIO BRN)
S1          8 POS DIP SW
S2          8 POS DIP SW (or 2 X 9 Berg header)
SIP1        4.7K, 10 pin Resistor SIP
V1          MC7805 Regulator
X1          Crystal 4.9152 Mhz
Micromint Text to Speech PC Board
Heat Sink THM6071B
Heat Sink THM6072B
Screw, 6/32 x 3/8
Nut, 6/32
Transformer PITB-109 22VCT @300 MA
Jack, Keystone 901, Submini phono
Connector, DB-25, RS-232C
Berg Strip 9 x 2 (see SW2 above)
Berg Strip 3 x 2
Berg Jumper (qty 2)
Case top
Case bottom
Case screws (2)
Standoff, (qty 4)
Screw, #4 x 3/4, self-tapping (qty 4)
Knob, volume control
Label (FCC/ID)
Face decal (MicroVox)
Front Plate
Back Plate
Grommet

Sockets

8 Pin solder  (1)
14 Pin solder (6)
16 Pin solder (4)
22 Pin solder (1)
24 Pin solder (3)
28 Pin solder (2)
40 Pin solder (2)
```

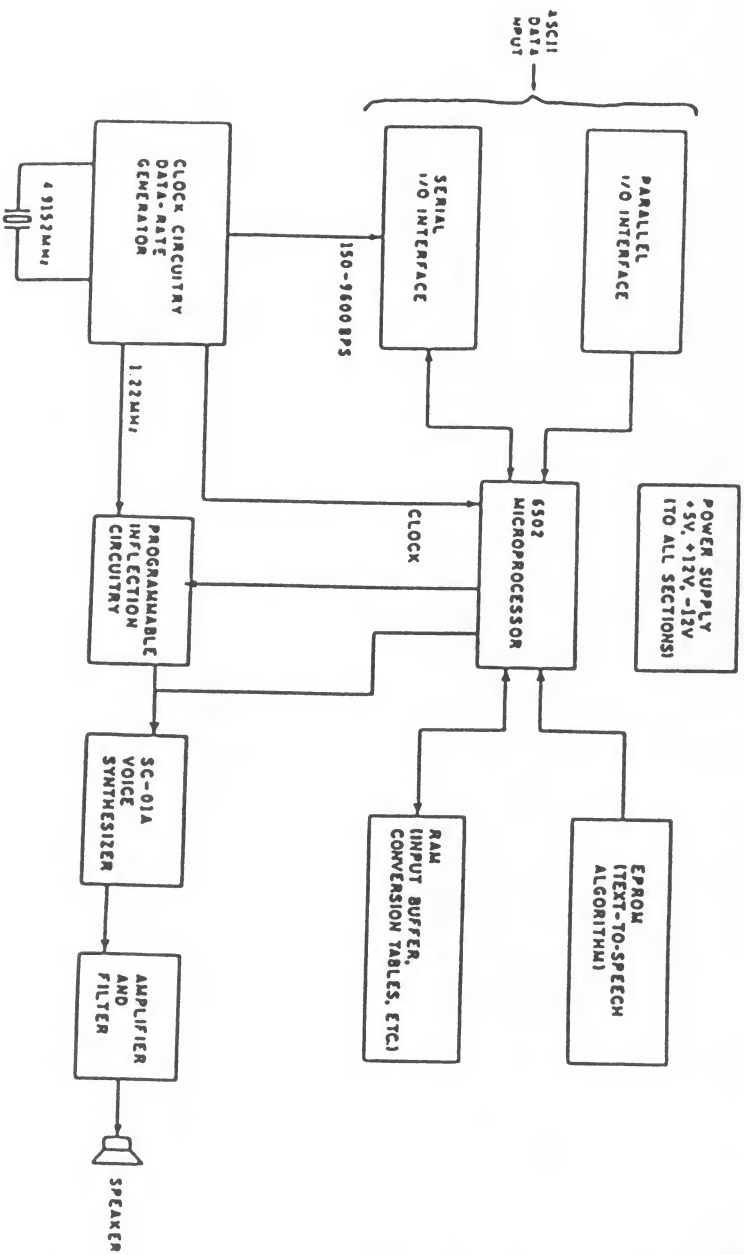

ASCII DATA INPUT
PARALLEL I/O INTERFACE
SERIAL I/O INTERFACE
150-9600 BPS
POWER SUPPLY (+5V, +12V, -12V TO ALL SECTIONS)
CLOCK CIRCUITRY DATA-RATE GENERATOR
4 (15.2 MHz)
1.22 MHz
6502 MICROPROCESSOR
CLOCK
PROGRAMMABLE INFLECTION CIRCUITRY
SC-01A VOICE SYNTHESIZER
AMPLIFIER AND FILTER
SPEAKER
RAM (INPUT BUFFER, CONVERSION TABLES, ETC.)
EPROM (TEXT-TO-SPEECH ALGORITHM)

Figure 1

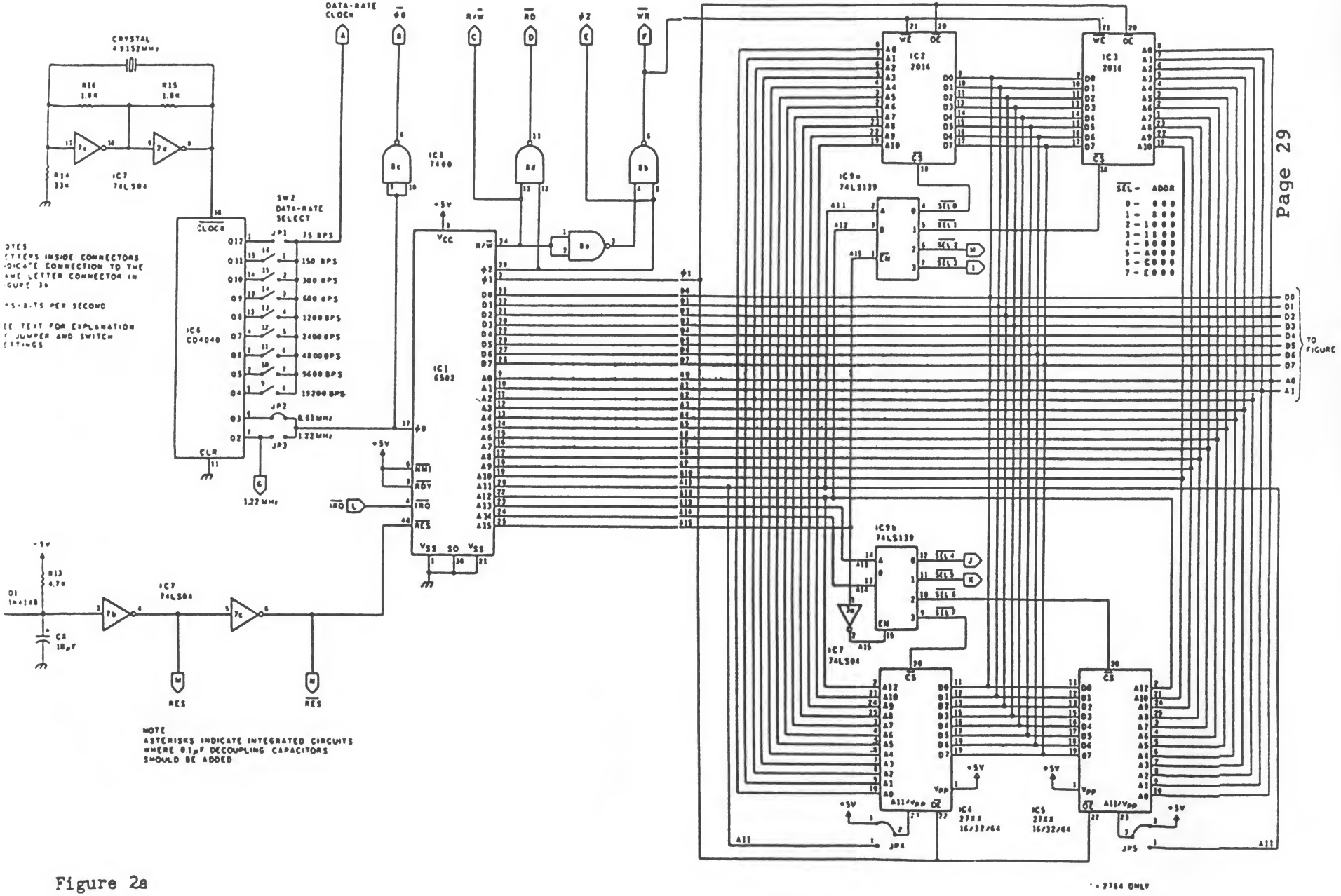

DATA-RATE CLOCK
CRYSTAL
4.9152MHz
R16 1.8K
R15 1.8K
R14 33K
IC7 74LS04
SW2 DATA-RATE SELECT
75 BPS
150 BPS
300 BPS
600 BPS
1200 BPS
2400 BPS
4800 BPS
9600 BPS
19200 BPS
JP1
JP2
JP3
0.61MHz
1.22MHz
IC6 CD4040
CLOCK
CLR
IC8 7400
IC1 6502
IRQ
NMI
RDY
RES
SO
IC2 2016
IC3 2016
IC9a 74LS139
IC9b 74LS139
SEL - ADDR
0 - 0 0 0
1 - 8 0 0
2 - 1 0 0 0
3 - 1 8 0 0
4 - 8 0 0 0
5 - A 0 0 0
6 - C 0 0 0
7 - E 0 0 0
IC4 2732 16/32/64
IC5 2732 16/32/64
JP4
JP5
TO FIGURE
* 2764 ONLY
NOTE
ASTERISKS INDICATE INTEGRATED CIRCUITS WHERE 0.1μF DECOUPLING CAPACITORS SHOULD BE ADDED

Figure 2a

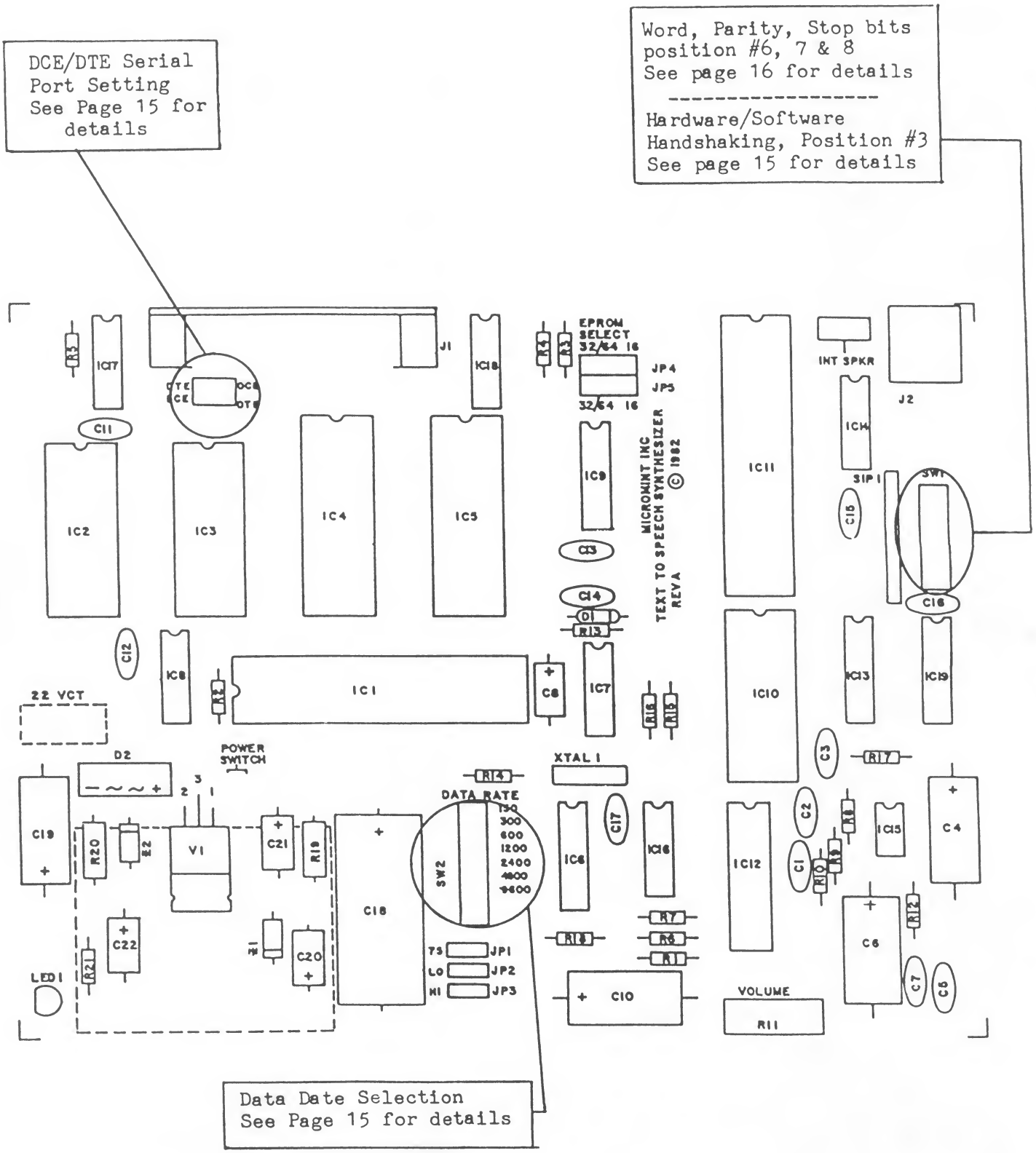
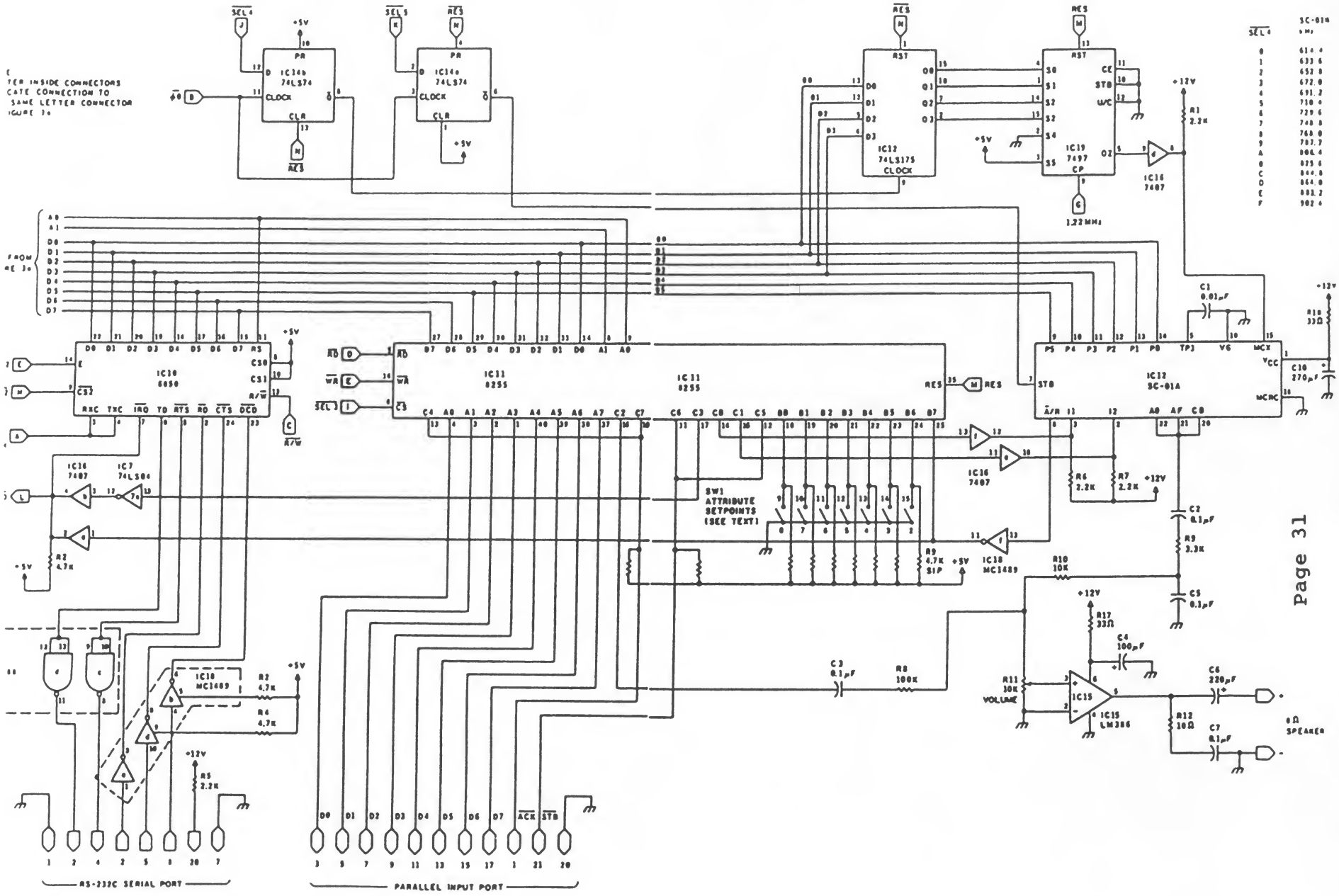

DCE/DTE Serial Port Setting See Page 15 for details
Word, Parity, Stop bits position #6, 7 & 8 See page 16 for details
Hardware/Software Handshaking, Position #3 See page 15 for details
Data Date Selection See Page 15 for details
EPROM SELECT 32/64 16
JP4
JP3
32/64 16
MICROMINT INC TEXT TO SPEECH SYNTHESIZER © 1982 REV A
INT SPKR
J1
J2
IC1
IC2
IC3
IC4
IC5
IC6
IC7
IC8
IC9
IC10
IC11
IC12
IC13
IC14
IC15
IC16
IC17
IC18
IC19
SIP1
SW1
SW2
C1
C2
C3
C4
C5
C6
C7
C8
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
C20
C21
C22
D1
D2
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
V1
E1
E2
22 VCT
POWER SWITCH
DATA RATE
110
300
600
1200
2400
4800
9600
XTAL 1
VOLUME
LED1
TS
LO
HI
JP1
JP2
JP3

Figure 2c


RS-232C SERIAL PORT
PARALLEL INPUT PORT
SW1 ATTRIBUTE SETPOINTS (SEE TEXT)
1.22MHz
VOLUME
8Ω SPEAKER

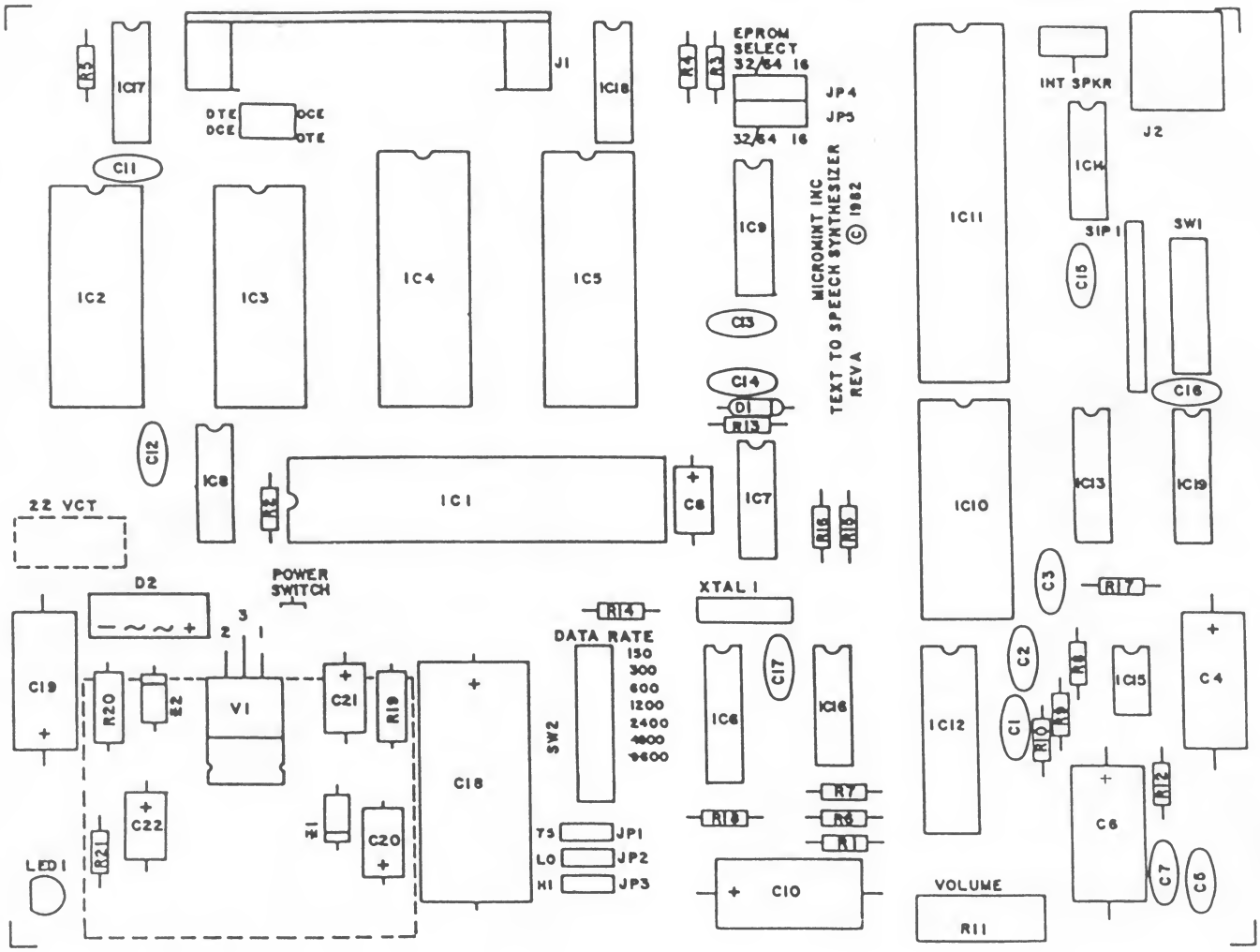

R5
IC7
J1
IC18
DTE
DCE
DCE
DTE
EPROM SELECT
32/64 16
JP4
JP3
32/64 16
R4
R3
C11
IC2
IC3
IC4
IC5
IC9
C13
C14
D1
R13
MICROMINT INC
TEXT TO SPEECH SYNTHESIZER
REV A
© 1982
IC11
INT SPKR
J2
IC14
SIP 1
SW1
C15
C16
C12
IC8
R2
IC1
C8
IC7
R16
R15
IC10
IC13
IC19
22 VCT
D2
POWER SWITCH
3
2
1
R14
DATA RATE
150
300
600
1200
2400
4800
9600
XTAL 1
C3
R17
C19
R20
E2
V1
C21
R19
C18
SW2
IC6
C17
IC16
IC12
C2
R8
IC15
C4
C1
R10
R9
R7
R6
R1
C6
R12
C7
C9
LED 1
R21
C22
E1
C20
TS
LO
HI
JP1
JP2
JP3
C10
VOLUME
R11

Figure 2c

Conditions of Sale and PRODUCT WARRANTY

MICROMINT, INC., and the Buyer agree to the following terms and conditions of this Sale and Purchase.

1. MICROMINT, INC. extends the following warranty; a factory manufactured circuit board or assembly carries with it a 90 day warranty covering both parts and labor. Any unit which is found to have a defect in materials or workmanship shall at the option of MICROMINT, INC. be repaired or replaced.
2. For repair of units which have expired their warranty, a minimum inspection fee must be prepaid. Contact MICROMINT, INC. for information on current minimum charges.
3. NO WARRANTY is extended on USER ASSEMBLED systems or kits. However, assembled kits will be inspected and repaired with charges based on the current minimum one hour charge. MICROMINT, INC. retains the right to refuse to repair any USER ASSEMBLED item. This right is at the sole discretion of MICROMINT, INC.. However, in the event that repair charges would exceed a reasonable amount, the user may be consulted for a determination. Repairs on user assembled items must be PREPAID. Return authorization must be obtained prior to any return.
4. MICROMINT, INC. shall not be responsible for repair or replacement of any units which become defective through user modification, negligence, abuse and/or mishandling, or improper installation.
5. MICROMINT, INC. shall not be responsible to the Buyer for any loss or claim of special or consequential damages.
6. All units returned for repair must have prior authorization from MICROMINT, INC.. A return authorization number may be obtained by phone or letter. Please retain a record of the return authorization number as most subsequent correspondence will reference the number. Under no circumstances is any product to be returned to MICROMINT, INC. without prior authorization. MICROMINT, INC. will assume no responsibility for unauthorized returns. All returns must be shipped prepaid. Insurance is recommended as losses by a shipping carrier are not the responsibility of MICROMINT, INC.. Repaired units will be returned with postage paid.
7. MICROMINT, INC. reserves the right to change any feature or specification at any time as well as the minimum charges and any other condition or warranty contained herein.

REV. 2/84

Microvox Errata Appendix

Appendix A

Additional Music Mode Instructions

Music Handshaking Requirement

The system can not receive data while it is actually playing music. The reason is that the music is generated by timing loops, and if the loops were interrupted to accept data, the timing would be thrown off and sour notes would result. Therefore, just before starting to play music, the Microvox sends a busy signal to the host computer and when it is done it sends a ready signal. It is the user's responsibility either to catch these signals in hardware or software and to suspend sending data while music is being played or to use a software timing loop to ensure that no data is sent while music is being played.

Music Error Messages

If the user sends data while music is being played, the data will be lost. The system will inform the user of the problem by saying "receiver overrun". Correcting this problem requires observing the "Music Handshaking Requirements" given above.

If there are typographical errors in the music codes, for instance 3H3 (there is no H in the musical scale) or 9G3 (there is no ninth octave in the music system), these errors will be read as text to alert the user to the problem. Once the errors are corrected, the music will play normally.

Appendix B

Handshaking

For software handshaking, switch position 3 on dip switch SW1 is set in the closed position (open is hardware handshaking). The default mode of the Microvox uses the characters Control-Q (ASCII 17) and Control-S (ASCII 19) so as to provide standard "X-ON,X-OFF" handshaking. The following option is provided:

!H (busy character)(ready character)

Example: !HBR

In the example shown, the Microvox will send the character "B" to the computer when it is unable to receive more data, and will send "R" to the computer when it is again ready to receive data. It is the responsibility of the computer programmer to write the software necessary for the use of these options. (Actually, the busy character is sent while there is still some room in the buffer, so that even a program written in a higher level language, such as BASIC, should have plenty of time to react.)

Appendix C

Software Reset

The Microvox does not have a RESET button. However sending the sequence !Z has the same effect as a reset button would have -- the same effect as turning off the power and turning it on.

Appendix D

Programmable Pause Between Words

Sometimes words are more intelligible if there is a pause between them. To force a pause between words, enter a number of comma's between words:

"test test,test,,test,,,test,,,,test"

Microvox Errata Appendix

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